

# Chapter 9

## Socio-economic research in the continental oases of Tunisia (Fatnassa)

by Mongi Sghaier (*Institut des Régions Arides, Médenine, Tunisia*)

### 9.1. Geography and political structures

Located in the Southwest of Tunisia, the oasis of Fatnassa belongs to the oases of Nefzaoua, delimited by the co-ordinates 33°30 and 34°15 North latitude and 8°30 and 9°10 East longitude. Administratively, the oasis of Fatnassa belongs to the delegation of Souk Lahad of the province of Kébili, bordered to the northwest by the provinces of Tozeur and Gafsa, to the west by the Algerian frontiers, to the southeast by the provinces of Tataouine and Médenine and to the east by the province of Gabès.

Referring to different regional zonings, the Nefzaoua is part of the southwest region, including the two provinces of Gafsa and Tozeur. According to the nomenclature of the National Program for the Planning of Arid Zones in Southern Tunisia (*Shéma directeur d'aménagement des zones arides du sud tunisien*), it is considered the central area of the southern Sahara, covering also the regions of Tozeur and Tataouine (DGAT, 1997). Extending over 2.208 millions ha -- of which 15,300 ha are oases (CRDA Kébili, 1998) -- the Nefzaoua is characterised by a Saharan Mediterranean climate with cold winters. The multiplication and stretching of oases over the whole territory (about 100 units) produces micro-climates which contrast with the surrounding desert environment. In fact, the oasis alleviates both the high summer and low winter temperatures, in addition to providing an efficient protection against winds.

Several ethnic groups are at the origin of the present population of Nefzaoua. The ancient Nefzaoua was populated by Berber tribes grouped under the name of Nybgenii, at the origin of the name Nefzaoua (Carton, 1914). According to Ibn Khaldoun "the legendary origin" of the people of Nefzaoua would be the name of nefzao, a son of loua, father of one of the Berber branches of the family of Botrs (Moreau, 1947). Today, Nefzaoua's population is formed from a mixture of several blood related groups of various origin. But, under the influence of Arabian tribes (especially Hilal and Soleim in the 11th century), the country has increasingly moved towards Arabic culture and customs.

### 9.2. Methodology

This paragraph presents the household sampling methodology for the household survey. The methodology consists of a stratified sampling indicated in the following table. As shown, stratification is achieved following four strata related to the surface of agricultural exploitation. The migratory status of 'migrant' (i.e. international migrant or return migrant) and 'non-migrant' (including internal migrants) is also taken into account in the definitions of strata. In this way, we have obtained eight proportional strata. The final sample is composed of 92 households, which is 20.7 percent of the entire population. Migrant and non-migrant households represent 73 and 27 percent of the total size of the total population as well as of the sample, respectively.

**Table 9.1. Composition of sample survey**

<b>Groups</b>							
Classes area (Ha)	Non migrant population	Non migrant sample	Migrant population	Migrant sample	Total population	Total sample	% of total population
G1 [0-0.25]	150	30	38	8	188	38	20,2
G2 [0.25-0.5]	73	15	33	7	106	22	20,7
G3 [0.5-1]	67	14	35	7	102	21	20,6
G4 >1	36	8	12	3	48	11	23
Total	326	67	118	25	444	92	20,7

### 9.3. Demography and migration

#### 9.3.1. Population development

Over the course of the past two centuries the Nefzaoua region has been characterised by continuous and gradual population growth. It grew from 18,000 at the beginning of the 20<sup>th</sup> century to currently 137,800 inhabitants, that is, an increase by a factor of 7.6. Population has grown more quickly during the past few decades. Indeed, the annual population growth rate, which was less than 2.5 percent prior to 1966, jumped rapidly to 4 percent, reflecting a positive migration balance.

**Table 9.2 Evolution of the population (by delegation) in Nefzaoua.**

Delegation	1975			1984			1994			1997*		
	M.	F.	Total	M.	F.	Total	M.	F.	Total	M.	F.	Total
Kébili North	7,975	8,760	16,735	12,507	12,821	25,328	13,911	13,887	27,798	14,533	14,507	29,040
Kébili South	6,145	6,505	12,650	7,477	7,418	14,895	13,288	12,891	26,179	13,882	13,468	27,350
Douz	10,348	10,682	21,030	13,717	13,717	27,506	19,219	19,029	38,248	20,074	19,876	39,950
Souk Lahad	7,034	8,056	15,090	10,192	10,192	20,757	13,499	13,824	27,323	14,100	14,440	28,540
Faouar	2,134	2,045	4,179	3,571	3,571	6,885	6,464	5,902	12,366	6,754	6,166	12,920
Province	33,636	36,048	69,684	47,464	47,907	95,371	66,381	65,533	131,914	69,343	68,457	137,800

Source: I.N.S 1997 (\* estimated)

This population increase is probably due to natural growth resulting from the improvement of hygiene and, therefore, a subsequently considerable decline in mortality (especially infantile). On the other hand, a significant improvement in standards of living has induced an increase in life expectancy. The total number of households is 21,316, which occupy 22,831 houses, as indicated in table 9.3. The average size of households in the oasis of Fatnassa is estimated to be 5.7 people, with a standard deviation of 1.9. The minimum and maximum size of households is 2 and 10 people, respectively. Households of small size (less than 4) represent only 30 percent of the sample group, while relatively large families (more than 6) are 37.7 percent (IMAROM surveys, 1999).

**Table 9.3 Number of houses and households in Nefzaoua (1994)**

Delegation	Number of houses	Number of households
Kébili Nord	5,511	4,920
Kébili Sud	4,504	4,242
Douze	5,968	5,648
Souk Lahad	4,739	4,550
Faouar	2,109	1,956
Total Povice	22,831	21,316

Source: INS 1997.

### 9.3.2. Migration

#### \* *Internal migration*

Internal migration has been observed historically over long periods of time, and it mainly affects the most dynamic and qualified portions of the population. Therefore "this migration represents not only a loss in manpower but also a loss in qualification" (Ben Hamadi 1979; Dypen 2000). Traditionally, the main type of migration in the region was constituted by a temporary and cyclical migration occurring during cereal harvest periods in the northwestern regions of the country ("Frigua"). Nefzaouan migrants practised the so-called h'taya (the operation of providing labour against part of a remuneration in kind, generally wheat) and then returned home in the same year with some bags of wheat. Currently, this type of pre-colonial migration no longer exists, to be replaced by other types of migration: as local migration towards the interior, national migration and external or international migration.

In fact the migratory movement in the Nefzaoua, like all other movement, are determined by a set of push and pull factors. The push factors are essentially related to the lack of real or potential resources, the lack of interesting jobs for newly educated generations and limited local agricultural resources. Pull factors are mainly economic. Primary internal migration destination areas for the Nefzaouan migrants are the relatively affluent regions on the coast or in the big cities (the industrial pole in Gabès, for instance) offering life and employment opportunities that do not exist in the Nefzaoua regions of the interior. This condition encourages many to search for better living environments in the dynamic cities and in more pleasant climatic zones. According to different censuses, the main natural destination regions for Nefzaouan migrants are Gabès, the mining zones of Gafsa, the capital and the coastal zones.

Besides the rather long-distance internal migration, a more localised internal local migration takes place essentially in the direction of cities such as Kébili, Douze, Souk Lahad, Faouar as well as newly created small localities situated around recently irrigated farms. In these places is found a concentration of administrative services and various economic activities.

#### \* *International migration*

International migration is a relatively recent phenomenon for the Nefzaoua. It started in 1956 and has accelerated through the collectivisation experience undertaken during the 1960s. This experience was carried forward between 1964 and 1969 by the Tunisian state. As mentioned in the table below, the main destination countries for Nefzaouan migrants are Western European countries, mainly France. Within the Arab world, Libya (the neighbouring oil-producing country) hosts the largest number of migrants. The Gulf countries only participate marginally in this sphere.

**Table 9.4 Number of Nefzaouan immigrants, as of 1973**

Destination Country	Origin		Total Nefzaoua	%
	Kébili	Douz		
France	6,125	713	6,838	78.8
Libya	1,396	218	1,634	18.8
Germany	65	40	105	1.2
Belgium	59	2	61	0.67
Netherlands	10	3	13	
Algeria	7	8	15	
Morocco	3	2	5	
Total	7,663	1,006	8,673	99.7
%	88.35	11.65	100.00	

Source : Ben Hamadi 1979, p. 249

However, it is interesting to notice that Kébili, and possibly the ‘peninsula’ zone, emerges as the principal generator supplying international migratory movements from the Nefzaoua region (88.35 percent of migrants originate from Kébili). This illustrates how the migratory phenomenon has affected mainly the oldest oasis zones (Kébili and the ‘peninsula’ of Kébili), where farming systems are based essentially on *khammassat*<sup>1</sup> production (Sghaier 1984). According to Baduel (1977), the period of massive departure of migrants abroad from Nefzaoua took place between 1969 and 1973. In the 1980s, the rate of migration remained relatively high. In 1984 it affected 26.5 percent of the active population of the region of Souk Lahad, representing 16.1 percent of the total population. According to recent evaluations, there is now a decrease in international migration compared to the 1970s-80s. In 1998, 27 percent of all households were involved in international migration.

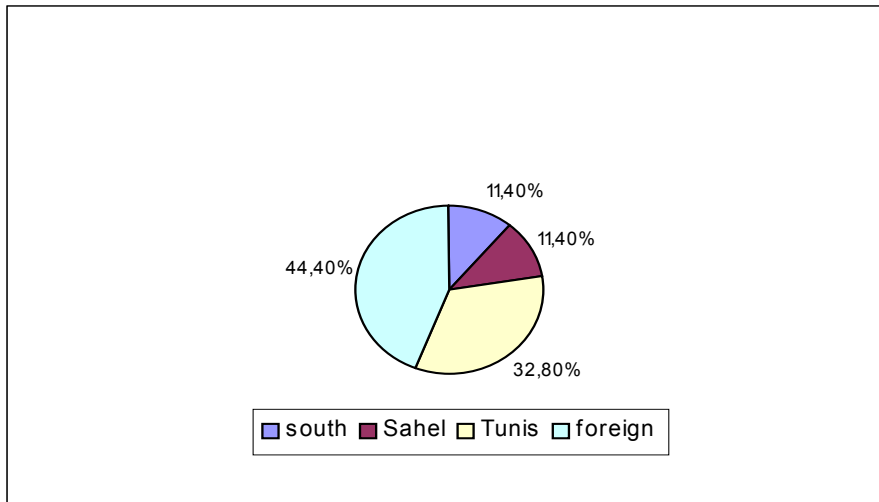
Migrants ensure the importation of an important volume of foreign currency, with an annual average of 5 millions Tunisian Dinars<sup>2</sup>. In 1997, these earnings were 3.411 million Dinars for the entire area of Nefzaoua, of which 71 percent were recorded at Kébili and Souk Lahad (ODS, 1999). Analysis of migratory movement at the level of the oasis households of Fatnassa reveals that 14 percent of the total population has direct ties with migrants, whereas 86 percent have never migrated.

Current migration patterns consist of three main flows: first, national migration towards the Sahel (Sfax and Sousse) and Tunis (the capital), which concerns 1.6 and 4.6 percent of the total population, as well as 11.4 and 32.8 percent of the migrant population, respectively. Secondly, local migration, which concerns the regions of the southeast and southwest, engages 1.6 percent (0.8 percent each) and 11.4 percent of total and migrant populations, respectively. Third, international migration, mainly directed at France, involves 6.3 percent of all migrants from Fatnassa, representing 43 percent of all migrants. The migrant population of the Fatnassa region is distributed as indicated in the figures below, according to migration status:

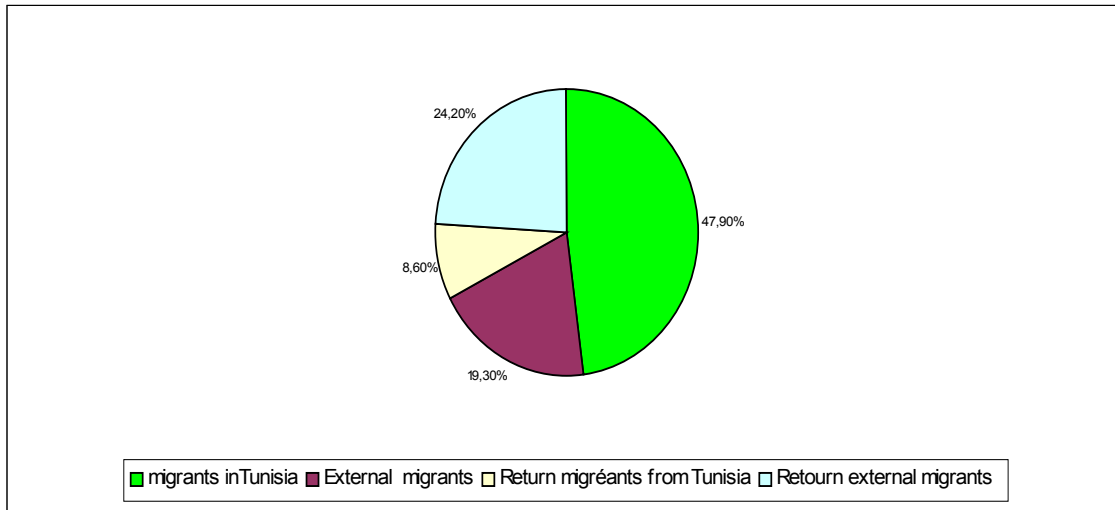
<sup>1</sup> A sharecropping arrangement is one in which the sharecropper receives one fifth of the harvest in exchange for his labour.

<sup>2</sup> The exchange rate of the Tunisian Dinar (DT) amounted 1.28 Euro (January 2001).

**Figure 9.1 Migration destination of migrants from Fatnassa**



**Figure 9.2 Migration status of the migrant population of Fatnassa**



It is important to note that a large share of the migration from Nefzaoua oases is seasonal. Indeed, only 45 percent of migrants are permanent, whereas 55 percent are seasonal workers. Within households, the greatest mobility is recorded among household heads, who collectively represent 59.4 percent of permanent migrants, while the migration of second-generation members is mostly seasonal in nature (accounting for 82.1 percent of seasonal household migration). National and local migration is marked by the departure of young people (accounting for 94.3 percent of internal migrants), whereas international migration is characterized by the departure of heads of household (accounting for 71.4 percent of current international migrants). The definitive return of migrants (re-migrants) concerns mainly heads of household.

Concerning recent trends and the future development of migration from Fatnassa oases, recent observations reveal that international migration is undergoing a period of regression due to an increasingly important rate of re-migration. Moreover, new flows of international migration by young men is nearly absent. The latter almost only participate in national and local migration. Furthermore, the mobility of household members is increasingly seasonally marked rather than permanent. It could be concluded, thus, that the conditions of destination regions are becoming increasingly unfavourable and repulsive factors are beginning to prevail. This mobility, characterised by longer periods of stay in the oasis, could

be attributed to repulsive factors in destination regions rather than the attraction factors in regions of origin.

Concerning the migratory strategies and departure motivations of household members, it was revealed that 60 percent of surveyed heads of household declare that no family members have the intention to live abroad. On the contrary, 64 percent of migrants surveyed reveal an intention to depart.

## **9.4. Agriculture**

### **9.4.1. General description**

The oases of Nefzaoua are distinguished by the importance of the population working in the agricultural sector, representing 40 percent of the total active population (this rate is less than 30 percent at the national level). Investigation of land ownership in 1998 (CRDA, 1998) reveals that the number of farmers in the region is 21,148, of whom 40 and 25 percent are concentrated in the delegations of Kébili and Souk Lahad, respectively. The commitment of the Nefzaouan population has been strengthened by the launching of the Water Planning Program for the South (*Plan Directeur des Eaux du Sud* (PDES)) and the other agricultural development projects. As a result of this initiative, the oasis area jumped from 6,000 ha at the beginning of the 1980s to 15,300 ha in the late 1990s, representing a growth rate of 255 percent. The oases of Nefzaoua are an important region for the production of dates destined for the international date market. In this region, agriculture is almost entirely oriented towards the date palm, and is much more commercial and modernised than, for example, the coastal oases of Mareth.

Water management in the oases used to function under traditional communal forms. These communal forms have recently been replaced by institutions of water management, called AIC (*Associations d'Intérêt Collectif*). The AIC are encouraged by the state, but the board of management is elected by water users. At present, there are approximately 90 AIC in the region. In its present shape, the first AIC dates from the 1950s. Over the last decade the Tunisian state invested more than 75 millions dinars (about 75 millions \$USA) in the development of agriculture in the region, which indicates the willingness of the State as an investor in developing the region and sustaining self-relying initiatives on the part of local populations.

### **9.4.2. Analysis of land ownership structure**

The region of Nefzaoua covers 345,000 ha of arable agricultural land, which represents 15.62 percent of the total area of the region (CRDA Kébili, 1997). The oases cover 15,300 ha, of which 36 ha are occupied by greenhouses heated by geothermal water. Cultivated areas occupied with date palms predominate. They are estimated in 1997 at 7,200 ha. Another 2,500 ha is occupied by fodder crops (mainly alfalfa) and 90 ha by other cash crops and vegetables.

**Table 9.5 Area and oasis occupation in the Nefzaoua (ha)**

Delegation	Total area	Date palm + fruit trees	Fodder	Cash crops	Legumes
Kébili North	4,222	4,222	3,621	1,649	74
Kébili South	2,042	2,042			
Souk Lahad	2,760	2,760	1,519	330	7
Douz	3,878	3,878	1,368	461	9
Faouar	2,502	2,502	690	87	
Total	15,404	15,404	7,198	2,527	90

Source: CRDA Kébili 1997

The average size of an agricultural exploitation is estimated at 0.22 ha (CRDA Kébili, 1998). In fact, 79 percent of farms are less than 0.25 has and only 7 percent are larger than 0.5 has. The ownership structure of oases is characterised by small and scattered holdings, which represent major constraints and threaten the viability of the oasis system itself. The main cause of this situation is determined by the customary laws of inheritance and the absence of any operational laws preventing the fragmentation of farms.

### 9.4.3. Changes in land occupation and water exploitation

#### *\* Illicit extension of oases*

The condition of “illicit” agricultural extensions located outside the traditional oases is problematic. In fact, by taking advantage of the encouragement of privatisation law through the mechanism of *Haouz* (which enables a form of collective land appropriation), some farmers took the initiative to appropriate collective lands belonging to their community. On the basis of privatisation law, farmers have the right to receive title deeds for land they colonise. Collective land has been privatised in Tunisia at a higher rate than, for example, in Morocco and Algeria. The Tunisian state pursues an active policy of privatisation, as the state considers collective land possession by communities as an obstacle to development.

So, land colonisation is not illicit and, in fact, is even encouraged by the state. However, practicing agriculture on these newly owned lands requires the creation of drillings for water extraction, which results in a conflicting situation: regarding legislation which protects the fossil groundwater of Nefzaoua, these drillings are illicit. The illicit status of these farms does not result from land ownership but rather from irregular access to water resources. This paradoxical situation results in patterns of non-secure ownership. Even though they benefit from a holding title granted by a local management council (*conseil de gestion*)<sup>3</sup> they face enormous difficulties in regularising their agricultural enterprise with other government services.

Following commitments of state investors and private initiatives in the agricultural sector in the region of Nefzaoua, which gained momentum since the 1980s and especially during the 1990s, newly created agricultural surfaces have increased rapidly. Current ownership regulations which deliberately encourage the privatisation of collective lands have played in favour of this dynamic.

<sup>3</sup> Councils responsible for and encouraging the privatization of collective land.

However, the implementation of legislation encouraging privatisation is confronted with legislation regulating the exploitation and access to water resources. In fact, over-exploited groundwater aquifers are subject to protection decrees. Also, the Nefzaoua is assigned as a protected region. In order to prevent illicit activities extracting water below 50 m in depth, the technical and administrative authorities are obliged indirectly to limit privatisation and land farming dynamics.

*\* Water exploitation*

The water consumption of oases, managed by the AICs, jumped from 3,827 l/s in 1983 to 4,863 l/s in 1992. Though existing at lower levels, non-agricultural demands have almost tripled during the same period, from 56 l/s in 1983 to 155 l/s by the end of 1992. The growth of agricultural as well as urban and industrial demands has generated a deficit and an increasingly chronic situation, resulting in an ever-increasing amount of resource exploitation. Interest conflicts between agricultural end users have been on the agenda since the beginning of the 1980s.

**Table 9.6 Evolution of water resource allocation, by category of users in the Nefzaoua (liters/second) <sup>4</sup>**

Year	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Users										
Oases (AIC)	3827	3751	3847	4443	4566	4455	4534	4559	4671	4863
Green houses	-	-	-	2	2	12	25	40	110	130
Illicit <sup>5</sup>	405	1100	1300	1452	1672	2100	2615	2645	2707	2810
Total agriculture	4232	4851	5147	5897	6240	6567	7174	7244	7488	7803
Industry	4	6	6	8	15	15	15	17	19	20
Drinking water <sup>6</sup>	52	56	60	60	87	88	90	95	108	135
<b>TOTAL</b>	<b>4288</b>	<b>4913</b>	<b>5213</b>	<b>5966</b>	<b>6342</b>	<b>6670</b>	<b>7279</b>	<b>7356</b>	<b>7615</b>	<b>7958</b>

Source: ARE Kébili 1994

#### 9.4.4. Agricultural production

The agricultural sector remains among one of the most important activities on which the economy of the region relies. Ecologically, the availability of ground water and the Saharan climate make the region highly suitable for the commercial production of dates. Historically, oasis systems are very old in this region, which remains a highly important source for date production.

*\* Date production*

As shown in table 9.7, the date palm has witnessed a relatively fast evolution, with a tendency towards conversion into highly remunerative varieties (*Deglet Nour*) that are highly suitable for marketing purposes. This number is estimated at 1.947 million feet, of which 1.415 are in production (57,000 tons/year). The production of dates, the main agricultural product of the region, increased at an accelerated rate following the implementation of oasis farming dynamics. In fact, production jumped from 7,290 tons in 1957 to 56,509 tons in 1997,

<sup>4</sup> 1000 l/s corresponds to approximately 31.5 mm<sup>3</sup>/year

<sup>5</sup> "Illicit": water managed and exploited by farmers in an illicit manner (without permission of the authorities concerned).

<sup>6</sup> "Drinking water": water managed by the national company for the exploitation and distribution of water (SONEDE).

representing an increase of about 800 percent in 4 decades. Yields have increased, too, due to the intensification and control of production techniques. They currently stand at 45 kg/foot (equivalent to 5 tons/ha).

**Table 9.7 Evolution of the size and structure of date plantations**

Year	Date palm (feet)	Deglat (feet)	% Deglat	Annual increase
1883 (1)	160,000	Non significant	0	6,667
1904-1905 (2)	300,000	"	0	50,000
1909 (3)	550,000	4,000	0.7	-
1949 (5)	700,000	70,000	10	12,328
1969 (6)	946,559	353,239	37.3	-
1981 (7)	947,400	584,400	61.7	70
1997 (8)	1,946,729	1,503,729	82	62,458

Sources : (1) (3) (5) : Moreau, 1947 p. 125. ; (2) Kearne, 1910 p. 277; (6) Ben Hammadi, 1979 p. 149. ; (7) DPSAE, 1981; (8) CRDA Kébili, 1998.

*\* Fruit trees*

Taking advantage of the newly created micro-climates provided by palm trees, an important number of fruit species (the 'second vegetation layer') are cultivated, including olive, fig, pomegranate, apricot and grapevines. However, the production of these fruit species remains marginal, as it is only destined secondarily for market. The yields are very low and even insignificant for some species because of a lack of know-how as well as the reduced interest of farmers. Therefore, fruit trees are only of marginal importance in the income of farmers, as well as in their decision-making mechanisms. The three main fruits produced in the oases of Nefzaoua are pomegranates (423 tons), figs (259 tons) and olives (207 tons).

*\* Cash crops and fodder production*

It has been known for a long time that oases are key sites for the exploitation of the herbaceous level (ground level). As they are engaged in an intensive agriculture, the farmers of Nefzaoua cultivate ground level crops during two farming periods. Summer is marked by strong competition for available irrigation water, coinciding with the highest period of water use. In this period, cultivated species include melons, watermelons, cucumbers, peppers and tomatoes. Winter is a period of relative water abundance, even in some marginal zones of the oasis. Cultivated species include carrots, turnips, beets, various vegetables and beans. The most important fodder crop is alfalfa, cultivated alone or in combination with barley. This crop can last for 3 to 4 successive years or more. Green barley also occupies an important surface and is cultivated in the autumn. Industrial crops are less well known, although they offer some satisfactory opportunities for adaptation; such crops include henna, cultivated in neighbouring coastal oases (Gabès, Cheninni) and cotton, whereas it is not possible to cultivate other crops.

**Table 9.8 Average area and production of cash cropping in Nefzaoua**

Type	Average area (ha)	Average production (tons)	Average yield (tons/ha)
Summer cash cropping	900	10,000	11.1
Winter cash cropping	1,300	13,000	10
Total	2,200	23,000	10.45

Source : CRDA Kébili, 1998

**Table 9.9. Area, production and yield of fodder in Nefzaoua**

Species	Average area (ha)	Average production (tons)	Average yield tons/ha
Alfalfa	3,378	226,680	67.1
Fodder sorghum	29.5	1,180	40
Green barley	1,361	54,440	40
Total	5,168.5	282,300	54.62

Source : CRDA Kébili, 1998

*\* Livestock*

The livestock herd in the region of Nefzaoua has increased continuously. Ovine and goat herds tripled between 1930 and 1980, after which they began to decline and stabilise in 1997 at approximately 125,000 head (65,000 ovine and 60,000 goats). The camel herd has not experienced significant changes and has remained at approximately 8,000 head since the 1950s.

## **9.5. Migration impact**

### **9.5.1. Non-agricultural and general impact**

*\* Education*

The educational level of heads of household within the Fatnassa oasis is relatively high. Seventy percent are literate, with 56.1 having attained koranic and primary school level, whereas 7.7 and 6.6 percent have reached secondary school and university, respectively. When considering the total population of school age and higher, one can notice that 19.9 percent are illiterate, whereas 35 percent are of koranic and primary school level, 34 percent are of secondary school level and only 11.6 percent have any academic formation.

**Table 9.10. Educational level of heads of household.**

	migrants		No migrants	
	School level		School level	
	Coun	%	Coun	%
no	7	28.0%	20	30.3%
coranik	15	60.0%	30	45.5%
primarv	2	8.0%	4	6.1%
secondarv	1	4.0%	6	9.1%
universit			6	9.1%
Total	25	100.0	66	100.0

Source: IMAROM surveys 1999

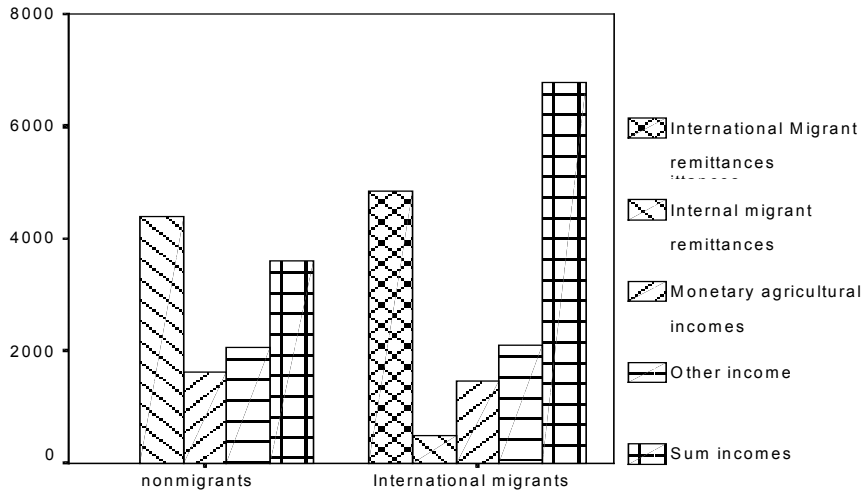
*\* Income and migration*

Mean family income is estimated to be 4,470 dinars/year with a standard deviation of 2,918 dinars/year, a minimum of 900 dinars/year and a maximum of 20,000 dinars/year. This reflects a higher wealth level compared to minimum guaranteed industrial and agricultural wages (SMIG and SMAG), which are lower than 2,000 dinars/year. This could be attributable to the importance of extra agricultural income, notably from migration remittances. Some clear differentials have been revealed between migrants and non-migrants, as their average yearly household income amounts to 6,780 DT and 3,609 DT, respectively. The minimum and maximum of respective family incomes are 900 and 2,000 DT/year on the one hand, and 11,500 and 20,000 DT/year on the other.

Migration income corresponds to the earnings of migrants, which are transferred to their families in the region of Fatnassa. Indeed, 7.6 percent of households declare having received incomes from internal migrants with an average of 3,843 DT/year, whereas 25 percent of them benefit from an international migration income of 4,848 DT/year. Concerning international migrants, 92 percent transfer to their families a minimum of 1,500 DT/year and a maximum of 8,000 DT/year (the standard deviation is 1,880 DT/year). The high-incomes of migrant households contribute to the improvement of the population's standard of living.

Households benefiting from an income originating from land or house rentals are rare (2 among 92 surveyed). Concerning income from other activities (trade, services, etc.), 66.3 percent of surveyed households declare that they benefit from an average income of 2,062 DT/year, but characterise such incomes by a high variability, with a minimum of 71 and a maximum of 7,000 DT. Migration does not have any effect on this income originating from other activities. Average incomes stemming from the other activities of migrants and non-migrants alike are nearly equal (2,100 DT/year and 2,054 DT/year).

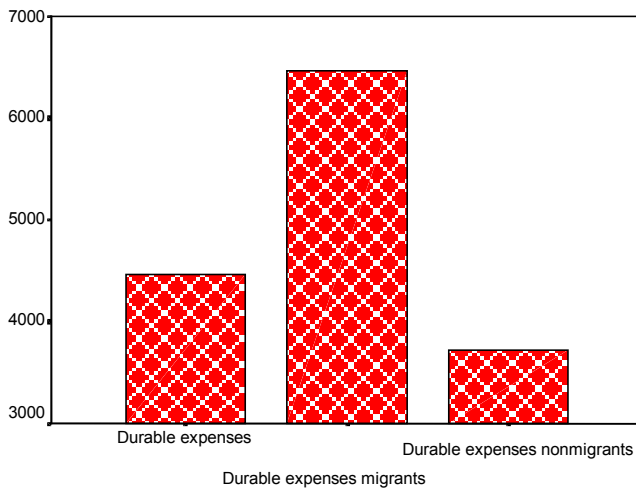
**Figure 9.3. Structure of household incomes in Fatnassa**

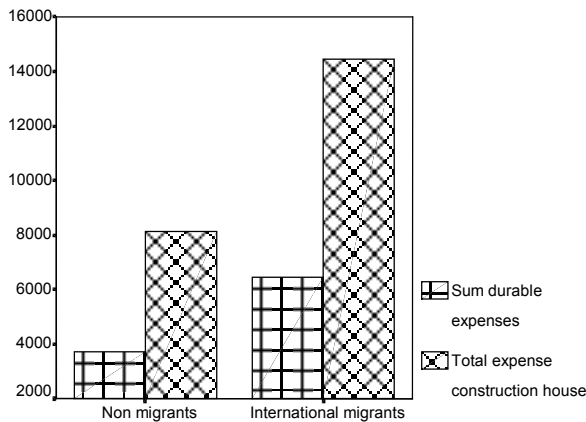


*\* Household expenditures*

Items considered in the calculation of the consumption budget of households include expenses for food, clothing, school, energy and electricity, health and ‘daily’ agricultural expenses. The average expenses of a household are 2,661 DT/year, with a standard deviation of 1,303 DT/year. The consumption budget of migrants (3,490 DT/year) is higher than that of non-migrants (2,351 DT/year). The food category represents the most important expense, with an average of 1,576 DT/year ( $\sigma = 629$  DT/year). Schooling scores the second, with 420 DT/year on average.

**Figure 9.4. ‘Durable expenses’, by migration (DT average per year per households)**



**Figure 9.5. Durable expenses (construction and other) in Fatnassa (average en DT)**

*\* Durable expenses (housing etc)*

Durable expenses concern the household expenses needed to acquire household (electronic) equipment or to construct houses during the last five years. They average 4,471 DT/year per household, with high variability translated by a standard deviation of 7,532 DT/year. The budget allocated to this category per year is significantly higher for migrants (6,468 DT on average) than for non-migrants (3,715 DT). It seems that households tend to give priority to housing construction. The average budget is 10,402 DT for 19 households, of which 7 are migrants who spend 14,429 DT against 8,142 DT for non-migrants (9 households).

### 9.5.2. Agricultural impacts

*\* Agricultural income*

The calculated average agricultural income of the surveyed group is 1,580 DT/year, with a relatively high variability (standard deviation = 1,173 DT/year). The minimum is 200 DT/year and the maximum is 8,000 DT/year. It shows that agricultural activity, particularly that based on the intensive and highly remunerative production of dates, can offer very good opportunities. This income doesn't vary much in relation to migration status. In fact, the agricultural income of non-migrants (1,626 DT/year) exceeds only by about 166 DT/year that of migrants.

*\* Agricultural equipment*

Without considering the use of small farming equipment (sap, pick, etc.), agricultural exploitation seems to be relatively under-equipped with heavy farm instruments. This is due mainly to the nature of oasis agriculture, characterised by a difficulty of access to mechanical devices and the reduced size of holdings, which poorly justifies the possession of heavy individual equipment. In fact, only 3 farmers (3.3 percent, all non-migrants) own a tractor. We observed that 29 percent of the surveyed group possesses a motor-pump, with 40 percent for migrants and 25 percent for non-migrants. In most cases these motor pumps are not used for pumping water from wells (this is generally done centrally through drillings managed by the AICs), but for pumping water from drains.

**Table 9.11. Purchase and installation of motor-pump**

	No migrants		migrants		total	
	Purchase and installation Of motor-pump		Purchase and installation Of motor-pump		Purchase and installation Of motor-pump	
	Count	%	Count	%	Count	%
	no	50	74,6%	15	60,0%	65
yes	17	25,4%	10	40,0%	27	29,3%
Total	67	100,0	25	100,0	92	100,0

Source: IMAROM surveys 1999

*\* Water management*

Water management is of the communal type, and is regulated by the AIC, which manages irrigation water extracted by central drillings. Only 2.2 percent of surveyed farmers (1 migrant and 1 non-migrant) have access to private drilling. Every farmer within the ‘regular’ oasis (not in illicit extensions) has the right to use irrigation water proportional to the requirements of his farm. This water need is partially related to cultivable surface, and is determined by the state’s technical services. Water is distributed according to a water tour from neighbour to neighbour via a “hand of water” flowing at 30 l/second. The cost of water is approximately 3 DT/hour. The average yearly contribution is approximately 100 DT per farmer, with a standard deviation of 129 DT, revealing a high variability in this factor. This contribution varies according to migration status, representing 127 DT for migrants and 89 DT for non-migrants.

*\* Other agricultural inputs*

Analysis of data obtained from the WP1 survey reveals that 61 and 78.3 percent of households, respectively, make use of organic manure and chemical fertilisers. The use of fungicides, pesticides and selected seeds is almost absent. Farm work is assured largely through family labour. Only 12 percent of farmers make use of paid labour. As table 9.12. indicates, there is no significant difference between migrants and non-migrants concerning the use of manure and the purchase of modern fodder. However, migrants tend to use fertilisers more often than non-migrants, which seems to reflect the slightly more modern and intensive agricultural practices of the former (see 5.2.3.).

**Table 9.12. Percentage of household use of agricultural inputs**

Inputs	Migrants	Non-migrant	Total
Fodder	64	63	63,5
Manure	64	60	62
Fertilisers	96	72	84

Figure 9.6 Percentage of households using manure

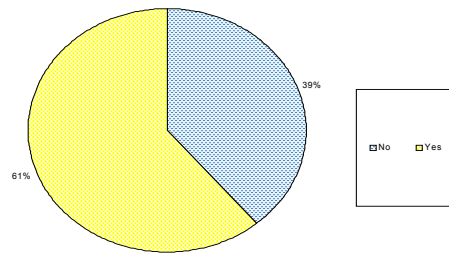


Figure 9.7 Percentage of households using fertilisers

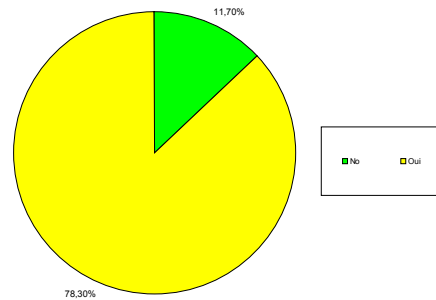
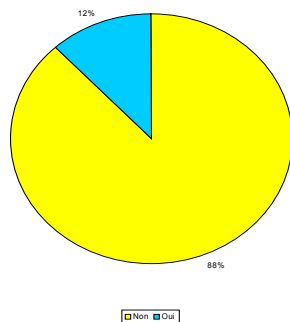


Figure 9.8 Percentage of households employing agricultural labourers

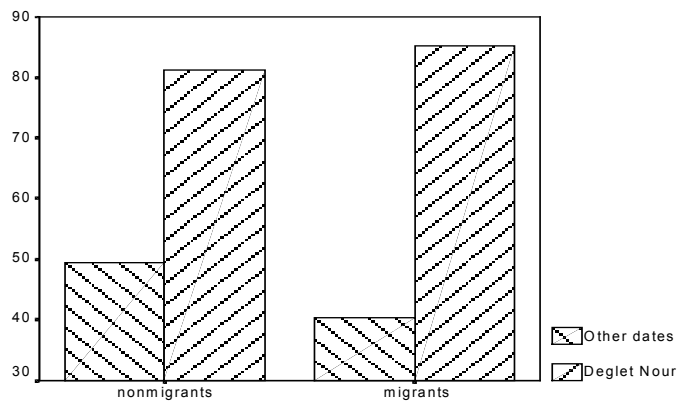


\* *The first vegetation layer: date palm cultivation*

Considered the pillar of oasis agriculture, the date palm -- forming the upper layer of classical oasis agriculture -- is made up of several varieties of differing degrees of economic importance. The date variety *Deglet Nour*, which produces fruit of very good quality destined mainly for export and/or for the national market, represents an average height of 82 feet with a standard variation of 61 feet. No major difference exists between migrants (average height of 85 feet) and non-migrants (81 feet). Other varieties are also represented with an average height of 47 feet (standard deviation = 38 feet) with a slight bias towards non-migrants (49

feet) compared to migrants (40 feet). The next question should logically be whether migration status has an effect on the structure and choice of date palm production.

**Figure 9.9 Choice of date palm variety, by migratory status of household**

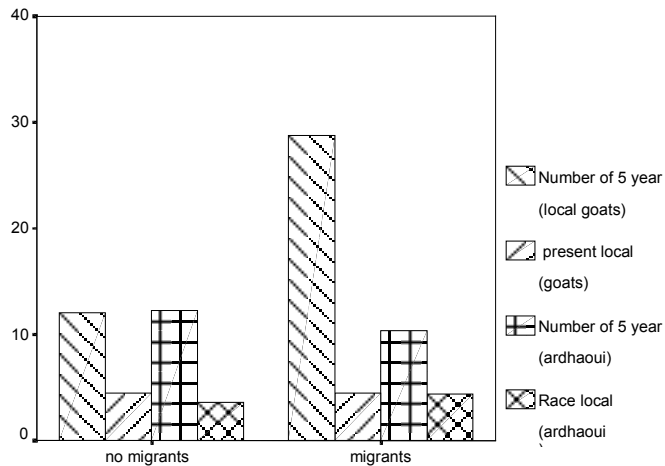


*\* The second vegetation layer: other fruit trees*

Fruit trees occupy the mid-level of the oasis. They are mainly represented by the fig tree (19 feet on average and 120 feet standard deviation, practised by 5 non-migrants and 3 migrants); the pomegranate tree (5 feet on average); and the apple tree (4 feet on average). While the date palm is cultivated by almost all farmers, fruit trees are only present with 10 farmers. On the one hand this reflects a general trend towards date palm mono-cropping, and on the other points to the progressive abandonment of fruit trees due to their low yields and heavy maintenance requirements.

*\* Livestock*

Livestock is produced by a reduced family herd made of ovine small ruminants (4 head per household on average) and goats (5 head on average). Camels are almost absent. Fifty-eight and 88 percent of all households possess sheep and goats, respectively. According to the household (work package 1) survey, it was found that the general herd size is becoming increasingly diminished. In fact, only five years ago the average size of the herd was 12 sheep and 18 goats. This situation is specific to Fatnassa and a few other oases. However, at the regional level (i.e., in most oases of the region), we have observed an increase in herd size.

**Figure 9.10. Livestock composition, by migratory status of household**

\* *The ground level: herbaceous crops*

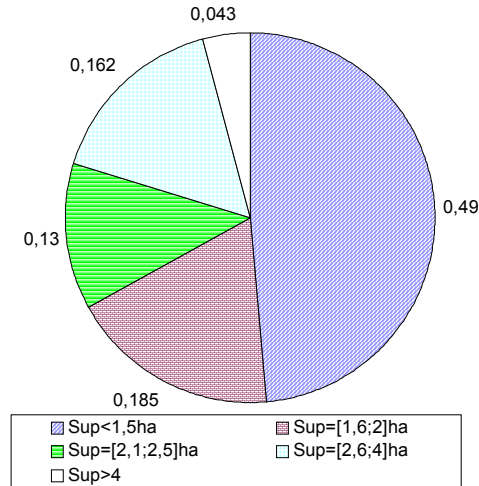
Herbaceous crops (vegetables, alfalfa) have been traditionally cultivated by oasis peasants to meet family and the livestock needs. However, cultivation of these crops has been greatly reduced following the water shortages of the 1970s. This situation continues to be evident particularly during the summer, and has been aggravated by wage increase as well as the shortage of agricultural labour. Household surveys confirm this tendency. In fact, only 48 percent of farmers grow alfalfa, whereas cash crops are completely absent.

### 9.5.3. Land ownership and agricultural investments

\* *Land ownership*

The 1999 household survey revealed that the average land owned per farmer is 1.86 ha, with a standard deviation of 1.03 ha, reflecting high intra- sample variability. In fact, a gap of 5.25 ha separates the smallest amount of ownership (0.25 has) from the largest (5.5 ha), which translates into a relatively unbalanced ownership structure. This fact is confirmed by figure 9.11, which indicates that only 4.3 percent of farmers possess more than 4 ha, whereas for 49 percent of farmers it does not exceed 1.5 ha.

This ownership structure is influenced by remarkable ownership disparities observed in the newly created oases, where it is easier to establish relatively large properties. In fact, maximum ownership size does not exceed 2.25 has in the traditional oases, whereas it is 5.5 ha in the modern oases. Seventy-one percent of farmers are in possession of plots both in the traditional and in the modern oases. 3.3 percent of farmers own 'illicit' plots, whereas 9.8 percent are in possession of non-irrigated plots.

**Figure 9.11. Land ownership structure in the oasis of Fatnassa**

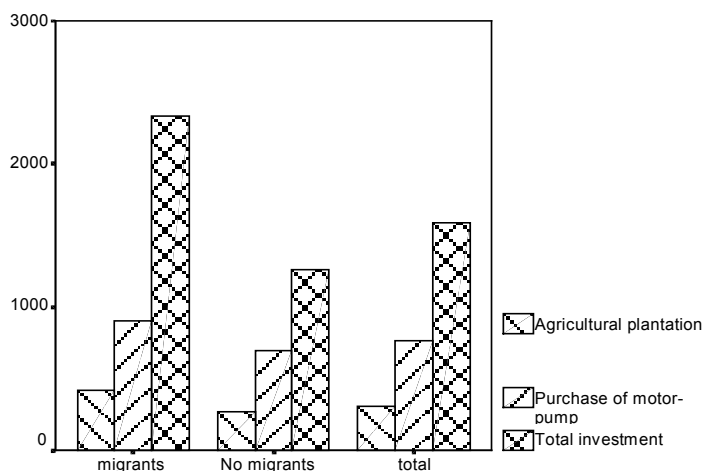
The migration status of households does not have a clear impact on the ownership structure of agricultural exploitation. Indeed, the analysed parameters are similar to those relative to the whole sample. Ownership transactions (purchases and sales) are only practised by 24 percent of the surveyed sample, with a slightly more elevated proportion for migrants (28 percent) against 22.4 percent for non-migrants. 70.6 percent of purchase operations (83 percent for migrants against 64 percent for non-migrants) and 71.4 percent of sales are recorded in the rainfed sector (not traditionally irrigated). The remainder of operations occur in the traditional oases.

*\* Agricultural investments*

The average agricultural investment volume mobilised by Fatnassa oasis households during the last five years is 1,585 DT, with relatively high variability ( $\sigma = 2.088$  DT). Migrants have allocated almost twice the volume for agricultural investments (2.330 DT) compared to non-migrants, who have spent only an average of 1,264 DT. 64 percent of farmers invest in palm tree plantations with an amount of 312 DT ( $\sigma = 366$  DT). Migrants (72 percent) allocate a higher investment of 413 DT ( $\sigma = 446$  DT) against 268 DT for non-migrants (61.2%) (see figure 9.12.).

Concerning their own perception of change in cropping patterns, 86 percent of surveyed households perceived clear changes in land use over the recent past. Migration status does not seem to have any impact on this perception (table 9.13). In terms of livestock husbandry, it seems that the majority of the population did not notice appreciable changes experienced by only 20 percent (figure 9.14).

Migratory status does seem to have an impact on future migration plans. In fact, the intention to move abroad is almost double (64 percent) for migrant households than for non-migrant households (31 percent) (table 9.14).

**Figure 9.12. Agricultural investments by household (1993-1998)****Table 9.13 Farmers' perception of changes in cropping systems**

	nonmigrants		migrants		total	
	Cultivated more or less cultures		Cultivated more or less cultures		Cultivated more or less cultures	
	Count	%	Count	%	Count	%
no	9	13,4%	4	16,0%	13	14,1%
yes	58	86,6%	21	84,0%	79	85,9%
Total	67	100,0	25	100,0	92	100,0

**Table 9.14 Farmers' perception of changes in animal husbandry**

	nonmigrants		migrants		total	
	Change in the production Of milk and animal		Change in the production Of milk and animal		Change in the production Of milk and animal	
	Count	%	Count	%	Count	%
no	52	77,6%	20	80,0%	72	78,3%
yes	15	22,4%	5	20,0%	20	21,7%
Total	67	100,0	25	100,0	92	100,0

**Table 9.15 Wish to migrate internationally, by migration status of household**

	nonmigrants		migrants		total	
	Do you desire to migrate ?		Do you desire to migrate		Do you desire to migrate	
	Count	%	Count	%	Count	%
	no	46	68,7%	9	36,0%	55
yes	21	31,3%	16	64,0%	37	40,2%
Total	67	100,0	25	100,0	92	100,0

## 9.6. Conclusion

Analysing migration as well as its agricultural and non-agricultural impacts is a delicate operation requiring at times that one admit to overly retractable hypotheses. The difficulty is given by the fact that we have to isolate the effects of a very complex phenomenon, migration, from a set of interlinked factors whose relationships are not yet sufficiently known. In addition, migration represents only one factor among other socio-economic and technical variables affecting soil and water resources in the oasis. This methodological constraint implies that cause-effect relationships should be considered with extreme caution when drawing conclusions. Nevertheless, it seems that comparison between the two groups (migrants and non-migrants) is possible without claiming to fully explain the impact of ‘cause and effect’ relations. The main reflections and orientations emerging from this analysis are:

- Comparison between migrant and non-migrant households has yielded clear differences that are not necessarily attributable only to the factor of migration. Certainly, migration represents a major factor, but it is not the only one. The same difference could probably be obtained if the comparison was achieved between two other socio-professional categories, such as non-migrants and state employees.
- Taking into account the first observation, we notice that the household and agricultural equipment level of migrant households is higher than that of non-migrant households. The same tendency is observed with respect to incomes and levels of household expenditures.
- The cropping system of migrant households is more intensive than non-migrant households, the former also tending to use more fertilisers, production factors and other inputs.
- However, concerning the possession of agricultural equipment, differences between the two groups are not large. This seems to be explained by the fact that in general oasis agriculture is not suitable for heavy equipment.

- Finally, we can conclude that migration status has an obvious impact on the improvement of living standards, reflected in an accumulation of capital on the one hand, and an improvement of cropping systems in the Fatnassa oasis on the other. This seems to diminish the tendency for young people to migrate internally and thus helps to combat the farming exodus.
- The impact on soil and water resources is rather difficult to identify because other important factors are involved, such as state programs for the rehabilitation and renovation of oases.

To conclude, we can affirm that migration has had a positive impact on several agricultural factors notably by:

- Enabling the role of agricultural investments; migration has permitted the extension of the agricultural surface on the one hand and the intensification of an existing agricultural system on the other;
- Modernising the agricultural system through the utilization of modern production techniques, as well as through agricultural intensification in general;
- Creating local employment opportunities for agricultural labourers.

